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(56) References cited:
EP-A- 0 070 999
EP-A- 0 086 425
EP-A- 0 128 504
US-A- 4 380 124
US-A- 4 453 564

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Description

This invention relates generally to motor vehicle fuel tanks comprising a unitary fuel reservoir.

Previously, unsuccessful attempts have been made to fluid pressure thermoform a fuel tank wall having a molded-in reservoir in the bottom surface of the tank, that is, to provide a convoluted bottom wall during thermoforming thereof to form a fuel reservoir. As used herein, fluid pressure thermoforming refers to any technique in which air (or other gas or liquid) pressure against the surface of a heated thermoplastic work piece is used to conform the work piece to the configuration of an underlying forming tool. Exemplary of well known fluid pressure thermoforming techniques is blow molding, in which a parison of molten thermoplastic material is formed and enclosed within a molding chamber. The ends to the parison are sealed and fluid pressure is injected into the parison to expand it outwardly against the surface of the molding chamber. Another exemplary fluid pressure thermoforming technique is vacuum forming, in which vacuum is applied from the surface of a molding tool causing atmospheric pressure to conform the work piece to the surface of the molding tool. Motor vehicle fuel tanks formed by such fluid pressure thermoforming techniques can provide significant cost and weight advantages and design flexibility advantages over fuel tanks formed of other materials and by other methods. It previously has not been possible, however, to fluid pressure thermoform a weight-competitive fuel tank with a suitably effective unitary fuel reservoir in a cost-effective manner without unacceptably thin tank wall areas (due to stretching of the wall material to form the reservoir) and other unacceptable structural deficiencies.

US-A 4 453 564 discloses a fuel tank for motor vehicles, of the type provided internally with a fuel feed pipe for connection to the fuel supply system of a motor vehicle engine. The tank includes an inner baffle wall extending between the lower and upper walls of the tank and surrounding the feed pipe so as to define a chamber having a reduced capacity with respect to the capacity of the tank and containing the fuel feed pipe, the chamber communicating with the remaining part of the tank through apertures in the inner wall. The tank is constituted by a lower half shell and an upper half shell which are welded together and have opposing main walls which respectively define the lower wall and the upper wall of the tank. The opposing main walls are provided with ribs which project therefrom and are in contact with another to define the inner baffle wall.

According to the invention there is provided a motor vehicle fuel tank comprising a fluid pressure thermoformed tank wall having a bottom wall (11) and opposed side walls (12a,12b) unitary with and extending upwardly from said bottom wall (11), said fuel tank comprising a fuel reservoir (20) unitary with said tank wall and having two opposed substantially C-shaped ridges (21a, 21b) extending upwardly into said tank from the plane of said bottom wall (11) each of said ridges (21a, 21b) being of certain height at a first end (22a, 22b) unitary with a corresponding one of said side walls (12a, 12b) and extending toward the opposed side wall to a second end (23a, 23b), each of said ridges from a point remote from said second end (23a, 23b) diminishing in height substantially continuously to approximately the plane of said bottom wall (11), said ridges (21a, 21b) cooperating to partially surround a portion of said surface area of said bottom wall (11), a channel (25a, 25b) between the second end of each said ridge and the other said ridge extending substantially in the plane of said bottom wall (11) to permit fuel to flow to said partially surrounded surface area (24) from the remaining portion of the surface area of said bottom wall (11).

Further according to the invention a method of forming a motor vehicle fuel tank having a unitary tank wall comprising a bottom wall and opposed side walls extending upwardly from said bottom wall, said fuel tank comprising a fuel reservoir unitary with said tank wall and comprising two opposed substantially C-shaped ridges extending upwardly into said tank from the plane of said bottom wall, each said ridge being of certain height at a first end unitary with a corresponding one of said side walls and extending toward the opposed side wall to a second end, said ridge from a point remote from said second end diminishing in height substantially continuously to approximately the plane of said bottom wall, said ridges cooperating to partially surround a portion of the surface area of said bottom wall, a channel between the second end of each said ridge and the other said ridge extending substantially in the plane of said bottom wall to permit fuel to flow to said partially surrounded surface area from the remaining portion of the surface area of said bottom wall, said method comprising;

(A) forming a parison of molten thermoplastic material;

(B) blow molding said parison while molten within a molding chamber, the molding surface of said molding chamber corresponding to the exterior contour of said fuel tank and providing reservoir wall-forming ridges corresponding to said C-shaped ridges of said fuel reservoir; and

(C) removing said fuel tank from said molding chamber after cooling of said thermoplastic material.

The motor vehicle fuel tank embodying the present invention can be formed of thermoplastic materials using fluid pressure thermoforming techniques, which fuel tanks provide a unitary fuel reservoir with more uniform wall thickness, larger reservoir volume, lower lost tank volume (due to the reservoir walls intruding into the tank volume) and at a lower cost than previously was feasible. In fact, prior to the present invention a fluid pressure thermoformed fuel tank having a unitary fuel reservoir was not commercially feasible, for example, for passenger vehicles. By virtue of the present invention such fuel tanks now are possible which not only provide a fuel reservoir of suitable volume but, in addition, do so with reservoir walls which are themselves of acceptably small volume (the reservoir wall volume constituting lost fuel volume within the

tank) wherein the tank wall material thickness is sufficiently maintained during formation of the resevoir walls that the cost and weight of the tank is competitive with alternative materials, designs, and manufacturing techniques. Other features and advantages of the invention will be apparent from the following detailed description thereof, and from the accompanying drawings illustrating one preferred embodiment of the invention.

The invention will now be described further by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a motor vehicle fuel tank (deleting fuel sender assembly and like devices and attachments, and shown partially in phantom) showing a unitary fuel reservoir in the bottom wall of the tank, according to a preferred embodiment of the invention;

Figure 2 is a plan view of the fuel reservoir and surrounding wall portions of the fuel tank of Figure 1;

Figure 3 is a side view of the fuel reservoir of Figure 2 shown in cross-section taken through line 3-3, showing the convolutions which form the fuel reservoir walls in the bottom wall of the tank;

Figure 4 is side view of the fuel reservoir of Figure 2, shown in cross-section through line 4-4, showing the convolutions in the fuel tank bottom wall forming the fuel reservoir walls; and

Figure 5 is an end view of the fuel reservoir of Figure 2, shown in cross-section through line 5-5, showing the convolutions of the bottom wall forming the fuel reservoir walls.

Referring now to Figs. 1-5, a fuel tank 10 is seen to comprise a bottom wall 11, side walls 12a and 12b, and walls 13a and 13b, and top wall 14, all of which walls collectively are referred to herein as the fuel tank wall. It can be seen that in the preferred embodiment illustrated in the drawings, the bottom wall 11 comprises steps 15a and 15b, between which the interior surface of the bottom wall is lower than the remaining portion of the bottom wall interior surface. In those embodiments wherein the surface area of the bottom wall proximate the fuel reservoir is depressed in such manner, any reference to the plane of the bottom wall is a reference to the plane of such depressed portion of the bottom wall surface area. Optionally, the surface area of the bottom wall within the fuel reservoir can be lower than the surface area of the bottom outside the fuel reservoir.

In the fuel tank illustrated in the drawings the tank walls are unitary with each other and the fuel reservoir 20 is unitary with the walls. The fuel reservoir is seen to comprise two opposed substantially C-shaped ridges 21a and 21b. The two fuel reservoir ridges are substantially identical in configuration. Each extends upwardly into the fuel tank from the plane of the bottom wall and extends laterally substantially parallel to the plane of the bottom wall from one side wall toward the other. More specifically, each ridge starts with a certain height at a first end 22a and 22b, which first end is unitary with a corresponding one of the side walls 12a and 12b, respectively. The height of the ridge can remain substantially constant over a first portion thereof and then diminishes preferably in a substantially continuous manner toward the second end of the ridge 23a and 23b at which point it fairs into the surface of the bottom wall of the fuel tank. The two ridges, that is the two fuel reservoir walls, cooperate to partially enclose a portion 24 of the bottom wall of the fuel tank. A channel is provided between the end of each fuel reservoir wall and the other fuel reservoir wall. Such channels 25a and 25b are coplanar with the surface of the bottom wall so as to permit fuel to flow into the fuel reservoir from the remainder of the fuel tank even when there is a low level in the tank.

It will be understood from the foregoing that fuel will be trapped within the fuel reservoir by the fuel reservoir walls. Thus, during vehicle acceleration, travel up or down an inclined slope and similar vehicle dynamics, fuel will be held within the reservoir available to the fuel sender assembly. The fuel sender assembly (not shown) can be according to any of the numerous designs well known to the skilled of the art. Typically, such fuel sender assembly would comprise a pump mounted either inside the tank or remote therefrom, and would further comprise a fuel pick-up port mounted to float on the surface of the fuel in the tank. As the fuel level drops the fuel pick-up port would descend therewith into the fuel reservoir area. Thus, the fuel reservoir acts to protect against interruptions in the supply of fuel from the fuel tank to the vehicle engine.

It is a particularly significant feature of the present invention that the fuel reservoir walls diminish in height from a point remote from the second end 23a, 23b, preferably from the point at which the wall begins to approach the other wall. Each wall fairs into the plane of the bottom wall at its second end. It has been discovered that this enables a significant increase in the volume of the reservoir and a significant increase in the ability of the reservoir to hold fuel under low fuel conditions. In fact, if the height of the reservoir wall is not diminished as it approaches the other wall and, rather, is continued at some height all the way to its second end, a suitable fuel tank is found to be infeasible in that webbing occurs across the channels 25a and 25b. That is, the severe stress placed upon the fuel tank wall by such design would cause an unwanted web or wrinkle of material to arise across the aforesaid channel. This, of course, would act as a dam preventing flow of fuel into the fuel reservoir area. This material stretch-generated web would not be avoided by using a lower viscosity material nor even by greater fluid pressure (within reasonably achievable levels) during the fluid pressure thermoforming process. While the web could be avoided by terminating the reservoir wall at a greater distance from the other reservoir wall, that is by widening the channel between the two walls, this would be highly undesirable in that it would significantly decrease the volume of the fuel reservoir and reduce the ability of the reservoir to entrap fuel during vehicle dynamics under low fuel conditions. The same would result if one at-

tempted to avoid the aforesaid stretch-generated web across the channels between the fuel reservoir walls by decreasing the height of each fuel reservoir wall in the area proximate the second end of the other fuel reservoir wall.

According to preferred embodiments of the invention, and as shown in the drawings, the first end 22a, 22b of the fuel reservoir walls forms an approximately 90° angle with the side wall 12a, 12b, respectively, of the fuel tank. If a fuel reservoir wall met the side wall at any other angle, then on one side thereof it would intersect at an acute angle. It will be understood by those skilled in the art that an acute angle of intersection would generate greater material stress in the course of thermoforming. This could be avoided only by providing a greater radius of curvature at the intersection or by lowering the height of the reservoir wall where it intersects the side wall. Providing a greater radius of curvature would necessarily increase the total volume of the reservoir wall which would, of course, mean that the total fuel volume of the fuel tank would be correspondingly decreased. As to lower height of the fuel reservoir wall at the intersection with the side wall, the significant disadvantages of lowering the reservoir wall height have already been discussed.

A significant advantage of the present fuel tank invention is the avoidance of thin sections in the tank wall. That is, it is found that a fluid pressure thermoformed fuel tank according to the invention is able to meet minimum wall thickness requirements employing starting material of less thickness than would be required by other configurations. While meeting minimum thickness requirements in the tank wall could be achieved also by employing a thicker starting material, this would involve a significant weight penalty which would result in a decrease in the fuel efficiency of the motor vehicle.

As mentioned above, fluid pressure thermoforming includes production techniques such as blow molding and vaccuum forming. According to a method aspect of the invention, a fuel tank, as described above, is vacuum formed or, more preferably, blow molded according to techniques known to the skilled in the art. Blow molding such fuel tank comprises forming a parison, that is a tube of molten thermoplastic material, and enclosing the parison within the chamber of the molding tool. The ends of the parison are pinched together to form a substantially fluid pressure-tight tube and fluid pressure is injected into such tube. The fluid pressure expands the parison against the surface of the molding tool which corresponds to the desired exterior contour of the fuel tank. Such molding tool also provides reservoir wall-forming ridges corresponding to the C-shaped ridges of the fuel reservoir. The blow molded fuel tank then is removed from the blow molding chamber, typically after some degree of cooling. It will be appreciated that in blow molded fuel tanks according to the invention the tank wall can be entirely unitary, including the convolutions in the bottom wall forming the fuel reservoir.

Numerous suitable thermoplastic materials will be apparent to the skilled of the art in view of the present disclosure. In general, if the fuel tank is to be employed in a passenger vehicle it should provide good "toughness" which is a function of both the elongation and tensile strength of the material. This includes low temperature toughness and, in particular, the material should have a glass transition temperature lower than the lowest temperature to which the fuel tank would be exposed in service. The material also should be sufficiently inert to the fuel which is to be carried in the fuel tank and to corrosive agents to which the fuel tank would be exposed in service. Presently preferred for use is a high density thermoplastic polyethylene of density between about .945 and about .952 grams per cm^3 (measured according to ASTM D-792), melt index not greater than about 12 grams per ten minutes (measured according to ASTM D-1238. Condition F using 21.6 Kgm weight), tensile strength at least about 2600 psi (measured according to ASTM D-638, Type 4, Spec Die "C" 50cc per minute), and elongation at least about 200 percent (measured according to ASTM D-638, Type 4, Spec Die "C" 50 cc per minute), and having carbon black content between about .75 percent and 1.25 percent by weight. Other suitable materials will be readily apparent to the skilled of the art in view of the present disclosure. It should be recognized that the suitability of materials will depend largely on the intended use of the fuel tank. Suitable means for reducing emissions of volatile hydrocarbon fuels or the like by permeation through the fuel tank wall are known to the skilled of the art. Included, for example, are fluorine gas treatments for the interior surface of the fuel tank and, at least in the case of polyethylene materials, the admixture of certain barrier resins.

If manufactured by a vacuum forming technique, the fuel tank typically would be formed in two halves, that is two shells, a lower half comprising the bottom wall with the fuel reservoir and a portion of the side and end walls, and the second half comprising the top wall and a portion of the side and end walls. The two halves would be sealed together according to methods well known to the skilled of the art to form the fuel tank.

Claims

1. A motor vehicle fuel tank comprising a fluid pressure thermoformed tank wall having a bottom wall (11) and opposed side walls (12a,12b) unitary with and extending upwardly from said bottom wall (11), said fuel tank comprising a fuel reservoir (20) unitary with said tank wall and having two opposed substantially C-shaped ridges (21a,21b) extending upwardly into said tank from the plane of said bottom wall (11) each of said ridges (21a,21b) being of certain height at a first end (22a,22b) unitary with a corresponding one of said side walls (12a,12b) and extending toward the opposed side wall to a second end (23a,23b), each of said ridges from a point remote from said second end (23a,23b) diminishing in height substantially continuously to approximately the plane of said bottom wall (11), said ridges (21a,21b) cooperating to partially surround a portion of said surface area of said bottom wall (11), a channel (25a,25b) between the second end of each said

ridge and the other said ridge extending substantially in the plane of said bottom wall (11) to permit fuel to flow to said partially surrounded surface area (24) from the remaining portion of the surface area of said bottom wall (11).

2. A fuel tank as claimed in Claim 1, wherein said first end of each of said ridges forms an approximately 90° angle with the side wall from which it extends, said certian height of said first end being substantially equal to the maximum height of said ridge.

3. A fuel tank as claimed in Claim 1 or 2, wherein said tank wall comprises high density thermoplastic polyethylene of density between about .945 and about .952, melt index not greater than about 12 grams per ten minutes, tensile strength at least about 2600 psi, elongation at least about 200% and having carbon black content between .75% and 1.25% by weight.

4. A fuel tank as claimed in any one of Claim 1 to 3, wherein said partially surrounded portion of said bottom wall surface is lower than at least a portion of said remaining portion of said bottom wall surface area.

5. A fuel tank as claimed in any one of the preceding claims, wherein said tank wall is vacuum formed.

6. A fuel tank as claimed in any one of Claims 1 to 4, wherein said tank wall is blow molded.

7. A method of forming a motor vehicle fuel tank having a unitary tank wall comprising a bottom wall and opposed side walls extending upwardly from said bottom wall, said fuel tank comprising a fuel reservoir unitary with said tank wall and comprising two opposed substantially C-shaped ridges extending upwardly into said tank from the plane of said bottom wall, each said ridge being of certain height at a first end unitary with a corresponding one of said side walls and extending toward the opposed side wall to a second end, said ridge from a point remote from said second end diminishing in height substantially continuously to approximately the plane of said bottom wall, said ridges cooperating to partially surround a portion of the surface area of said bottom wall, a channel between the second end of each said ridge and the other said ridge extending substantially in the plane of said bottom wall to permit fuel to flow to said partially surrounded surface area from the remaining portion of the surface area of said bottom wall, said method comprising;

(A) forming a parison of molten thermoplastic material;

(B) blow molding said parison while molten within a molding chamber, the molding surface of said molding chamber corresponding to the exterior contour of said fuel tank and providing reservoir wall-forming ridges corresponding to said C-shaped ridges of said fuel reservoir; and

(C) removing said fuel tank from said molding chamber after cooling of said thermoplastic material.

8. A method as claimed in Claim 7, wherein said thermoplastic material comprises high density thermoplastic polyethylene of density between about .945 and about .952 melt index not greater than about 12 grams per ten minutes, tensile strength at least about 2600 psi, elongation at least about 200%, and having carbon black content between about .75% and 1.25% by weight.

Revendications

1. Réservoir à carburant pour véhicules automobiles comprenant une paroi de réservoir thermoformée constituée d'une paroi de fond (11) et de parois latérales opposées (12a, 12b) faisant corps avec cette dernière et qui s'élèvent sur celle-ci, ce réservoir à carburant comprenant un puisard à carburant (20) faisant corps avec cette paroi du réservoir et possédant deux côtes opposées (21a, 21b) approximativement en forme de C, qui s'élèvent sur le plan de cette paroi de fond (11) pour faire saillie dans ce réservoir, chacune de ces côtes (21a, 21b) étant d'une certaine hauteur à une première extrémité (22a, 22b), qui fait corps avec l'une, correspondant, de ces parois latérales (12a, 12b) et se dirigeant vers la paroi latérale opposée, jusqu'à une deuxième extrémité (23a, 23b), chacune de ces côtes diminuant de hauteur de façon pratiquement continue à partir d'un point situé à distance de cette deuxième extrémité (23a, 23b) pour atteindre approximativement le plan de cette paroi de fond (11), ces côtes (21a, 21b) coopérant pour entourer partiellement une portion de la région de la surface de cette paroi de fond (11), un canal (25a, 25b) subsistant entre cette deuxième extrémité et ces côtes et l'autre ce ces côtes s'étendant pratiquement dans le plan de cette paroi de fond (11) pour permettre à du carburant de s'écouler de la partie restante de l'aire de la surface de cette paroi de fond (11) vers cette aire de surface (24) qui est partiellement entourée.

2. Réservoir à carburant selon la revendication 1, dans lequel cette première extrémité de chacune de ces côtes forment un angle d'environ 90° avec la paroi latérale d'où elle part, cette certaine hauteur de cette première extrémité étant pratiquement égale à la hauteur maximum de cette côte.

3. Réservoir à carburant selon la revendication 1 ou 2, dans lequel cette paroi du réservoir comprend du polyéthylène thermoplastique à haute densité, d'une densité comprise entre environ 0,945 et environ 0,952 g/cm^3, d'un indice de fusion on supérieur à environ douze gramme par dix minutes, d'une résistance à la traction d'au moins environ 182,80 kg/cm2 (psi) , et d'un allongement d'au moins environ 200 pourcent et possédant une teneur en noir de carbone comprise entre environ 0,75 pourcent et 1,25 pourcent en poids.

4. Réservoir à carburant selon une quelconque des revendications 1 à 3, dans lequel cette portion partiellement entourée de cette surface de paroi de fond est située à un niveau inférieur à celui d'au moins une portion de cette portion restante de cette aire de surface de paroi de fond.

5. Réservoir à carburant selon une quelconque des revendications précédentes, dans lequel cette paroi du réservoir est obtenue par dépression.

6. Réservoir à carburant selon une quelconque des revendications 1 à 4, dans lequel cette paroi du réservoir est moulée par soufflage.

7. Procédé de formage d'un réservoir à carbu-

rant pour véhicule automobile possédant une paroi de réservoir d'un seul tenant qui comprend une paroi de fond et des parois latérales opposées qui s'élèvent sur cette paroi de fond, ce réservoir à carburant comprenant un puisard à carburant-faisant corps avec cette paroi de réservoir et comprenant deux côtes opposées, approximativement en forme de C, qui s'élèvent sur le plan de cette paroi de fond, et font saillie dans le volume intérieur de ce réservoir, chacune de ces côtes étant d'une certaine hauteur, à une première extrémité qui fait corps avec une, correspondante, de ces parois latérales et s'étendant vers la paroi latérale opposée pour aboutir à une deuxième extrémité, cette côte diminuant de hauteur de façon relativement continue, à partir d'un point situé à distance de cette deuxième extrémité, pour atteindre approximativement le plan de cette paroi de fond, ces côtes coopérant pour entourer partiellement une portion de l'aire de surface de cette paroi de fond, un canal qui subsiste entre cette deuxième extrémité de chacune de ces côtes et l'autre de celles-ci, s'étendant approximativement dans le plan de cette paroi de fond, pour permettre à du carburant de s'écouler de la portion restante de l'aire de surface de cette paroi de fond dans cette aire de surface partiellement entourée, ce procédé consistant à;

(A) former une ébauche de matière thermoplastique en fusion;

(B) mouler cette ébauche par soufflage pendant qu'elle est à l'état fondu, dans une chambre de moulage, la surface de moulage de cette chambre de moulage correspondant à la configuration extérieure de ce réservoir à carburant et présentant des côtes de moulage de la paroi du puisard qui correspondent à ces côtes en forme de C de ce puisard à carburant; et

(C) extraire ce réservoir à carburant de cette chambre de moulage après la refroidissement de cette matière thermoplastique.

8. Procédé selon la revendication 7, dans lequel cette matière thermoplastique est un polyéthylène thermoplastique à haute densité, d'une densité comprise entre environ 0,945 et environ 0,952 g/cm^3, d'un indice de fusion non supérieur à environ douze grammes par dix minutes, d'une résistance à la traction d'au moins environ 182,80 kg/cm^2 (2600 psi), et d'un allongement d'au moins environ 200 pourcent et possédant une teneur en noir de carbone comprise entre environ 0,75 pourcent et 1,25 pourcent en poids.

Patentansprüche

1. Kraftstofftank für ein Kraftfahrzeug, umfassend eine mit Flüssigkeitsdruck thermogeformte Tankwand mit einer Bodenwand (11) und einander gegenüberliegenden Seitenwänden (12a, 12b) in einer Einheit mit der genannten Bodenwand (11) und sich von dieser nach oben erstreckend, wobei der genannte Kraftstofftank einen Kraftstoffbehälter (20) in einer Einheit mit der genannten Tankwand umfaßt, und zwei einander gegenüberliegende Rippen (21a, 21b) im wesentlichen in C-Form aufweist, die sich von der Ebene der genannten Bodenwand (11) nach oben in den genannten Tank erstrecken, wobei jede der genannten Rippen (21a, 21b) an einem Ende (22a, 22b), in einer Einheit mit einem entsprechenden der genannten Seitenwände (12a, 12b), eine bestimmte Höhe hat und sich in Richtung auf die gegenüberliegende Seitenwand bis zu einem zweiten Ende (23a, 23b) erstreckt, wobei die Höhe jedes der genannten Rippen im wesentlichen kontinuierlich von einem vom genannten zweiten Ende (23a, 23b) entfernt gelegenen Punkt aus bis etwa zur Ebene der genannten Bodenwand (11) abnimmt, wobei die genannten Rippen (21a, 21b) gemeinsam teilweise einen Abschnitt der genannten Oberfläche der besagten Bodenwand (11) umgeben, wobei sich ein Kanal (25a, 25b) zwischen dem zweiten Ende jedes der genannten Rippen und der anderen genannten Rippe im wesentlichen in der Ebene der genannten Bodenwand (11) erstreckt, damit Kraftstoff zu der genannten teilweise umgebenen Oberfläche (24) vom verbleibenden Abschnitt der Oberfläche der genannten Bodenwand (11) fließen kann.

2. Kraftstofftank nach Anspruch 1, worin das genannte erste Ende jedes der genannten Rippen einen Winkel von etwa 90° mit der Seitenwand, von der er sich erstreckt, bildet, wobei die genannte bestimmte Höhe des ersten Endes im wesentlichen gleich gross der maximalen Höhe der genannten Rippe ist.

3. Kraftstofftank nach Anspruch 1 oder 2, worin die genannte Tankwand aus hochdichtem thermoplastischem Polyethylen mit einer Dichte zwischen etwa 0,945 und etwa 0,952, einem Schmelzindex von höchstens etwa 12 Gramm pro 10 Minuten, einer Zugfestigkeit von wenigstens etwa 2600 Psi, einer Dehnung von wenigstens etwa 200% und mit einem Rußgehalt zwischen 0,75 und 1,25 Gew.-% besteht.

4. Kraftstofftank nach einem der Ansprüche 1 bis 3, worin der genannte teilweise umgebene Abschnitt der genannten Bodenwandfläche niedriger als wenigstens ein Abschnitt des genannten verbleibenden Abschnitts der genannten Bodenwandfläche ist.

5. Kraftstofftank nach einem der vorhergehenden Ansprüche, worin der genannte Tank vakuumgeformt ist.

6. Kraftstofftank nach einem der Ansprüche 1 bis 4, worin die genannte Tankwand blasgeformt ist.

7. Verfahren zum Formen eines Kraftstofftanks für ein Kraftfahrzeug mit einer einheitlichen Tankwand, umfassend eine Bodenwand und einander gegenüberliegende Seitenwände, die sich von der genannten Bodenwand nach oben erstrecken, wobei der genannte Kraftstofftank einen Kraftstoffbehälter in einer Einheit mit der genannten Tankwand umfaßt, und zwei einander gegenüberliegende Rippen im wesentlichen in C-Form aufweist, die sich von der Ebene der genannten Bodenwand nach oben in den genannten Tank erstrecken, wobei jeder der genannten Rippen an einem Ende, in einer Einheit mit einem entsprechenden der genannten Seitenwände, eine bestimmte Höhe hat und sich in Richtung auf die gegenüberliegende Seitenwand bis zu einem zweiten Ende erstreckt, wobei die Höhe jedes der genannten Rippen im wesentlich kontinuierlich von einem vom genannten zweiten Ende entfernt gelegenen

Punkt aus bis etwa zur Ebene der genannten Bodenwand abnimmt, wobei die genannten Rippen gemeinsam teilweise einen Abschnitt der genannten Oberfläche der besagten Bodenwand umgeben, wobei sich ein Kanal zwischen dem zweiten Ende jedes der genannten Rippen und der anderen genannten Rippe im wesentlichen in der Ebene der genannten Bodenwand erstreckt, damit Kraftstoff zu der genannten teilweise umgebenen Oberfläche vom verbleibenden Abschnitt der Oberfläche der genannten Bodenwand fließen kann, wobei das genannte Verfahren die folgenden Schritte beinhaltet:

A) Formen eines Schlauches von geschmolzenem thermoplastischem Material;

B) Blasformen des genannten Schlauches im geschmolzenen Zustand innerhalb einer Formkammer, wobei die Formoberfläche der genannten Formkammer den äußeren Umrissen des genannten Kraftstofftanks entspricht, und Herstellen von die Behälterwand bildenden Rippen, die den genannten Rippen in C-Form des genannten Kraftstoffbehälters entsprechen; und

C) Herausnehmen des genannten Kraftstofftanks aus der genannten Formkammer nach dem Abkühlen des genannten thermoplastischen Materials.

8. Verfahren nach Anspruch 7, worin das genannte thermoplastische Material aus hochdichtem thermoplastischem Polyethylen mit einer Dichte zwischen etwa 0,945 und etwa 0,952, einem Schmelzindex von höchstens etwa 12 Gramm pro 10 Minuten, einer Zugfestigkeit von wenigstens etwa 2600 Psi, einer Dehnung von wenigstens etwa 200% und mit einem Rußgehalt zwischen etwa 0,75 und 1,25 Gew.-% besteht.

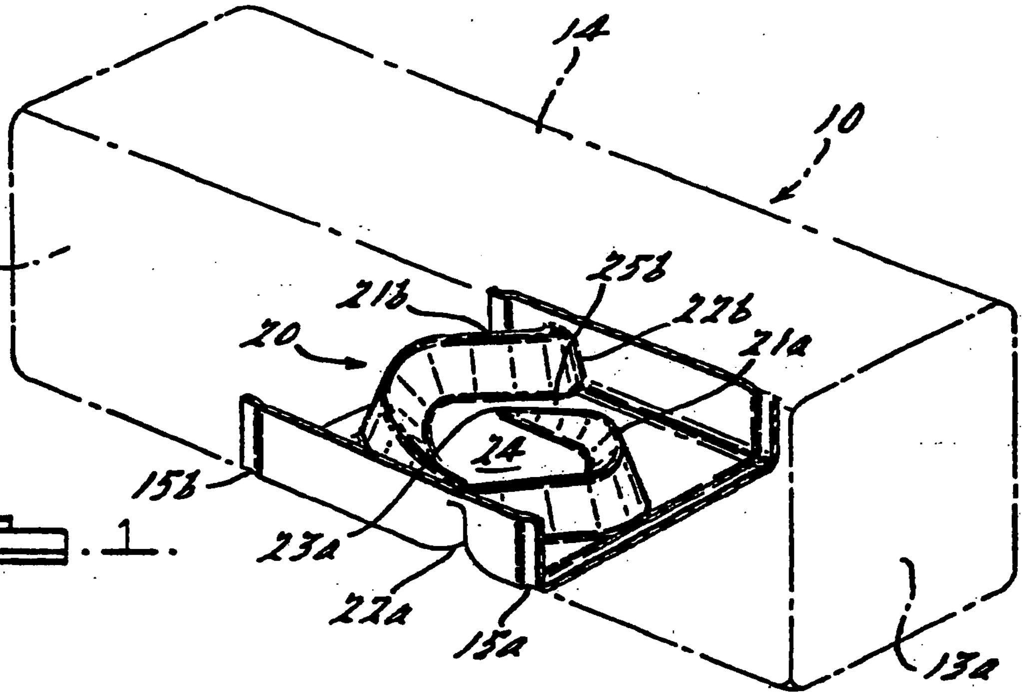
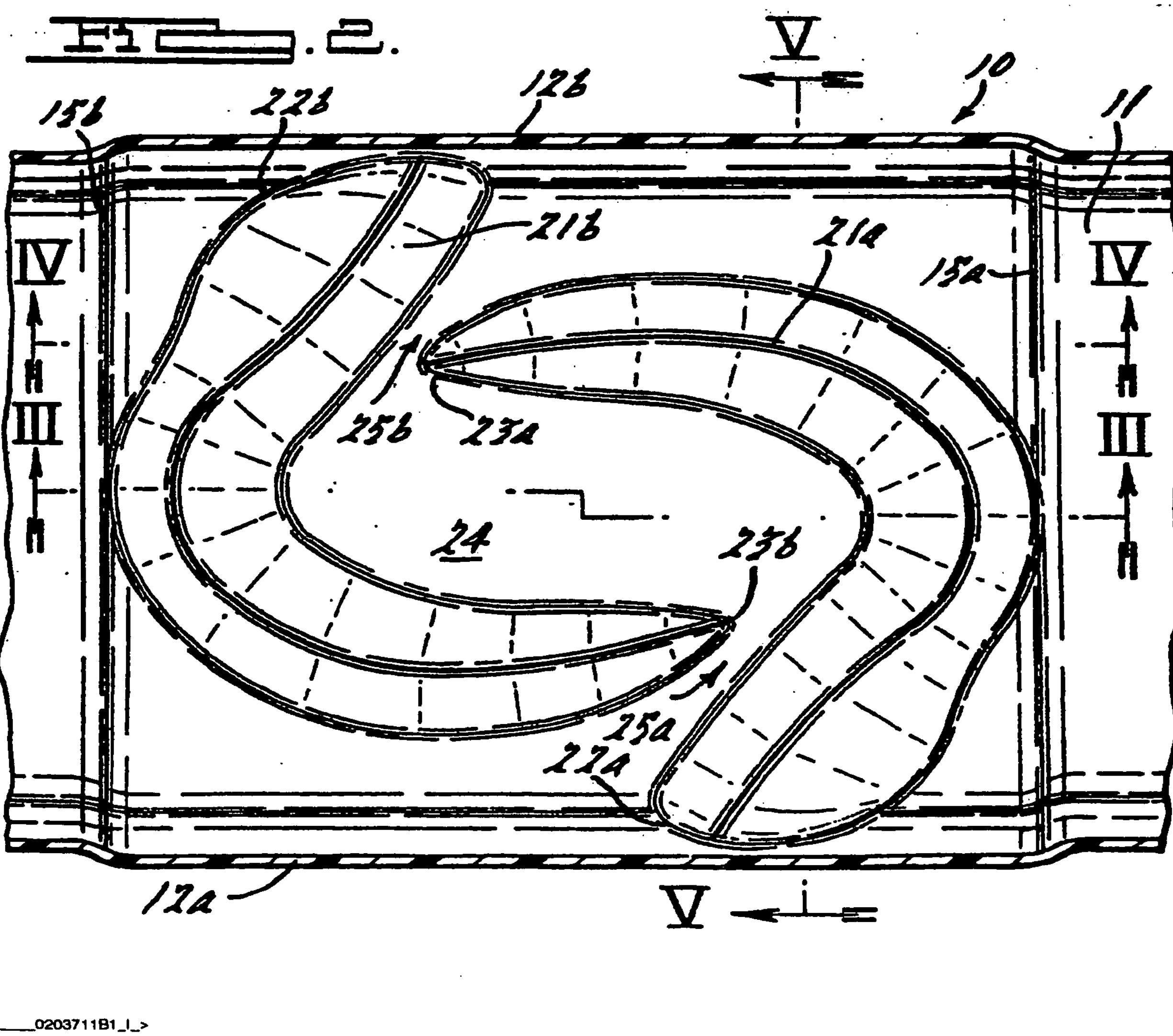

14
10
12a
21b
25b
22b
21a
20
24
15b
23a
22a
15a
13a

FIG. 1.

FIG. 2.


V
10
15b
22b
12b
11
21b
IV
IV
15a
21a
III
III
25b
23a
24
23b
25a
22a
12a
V

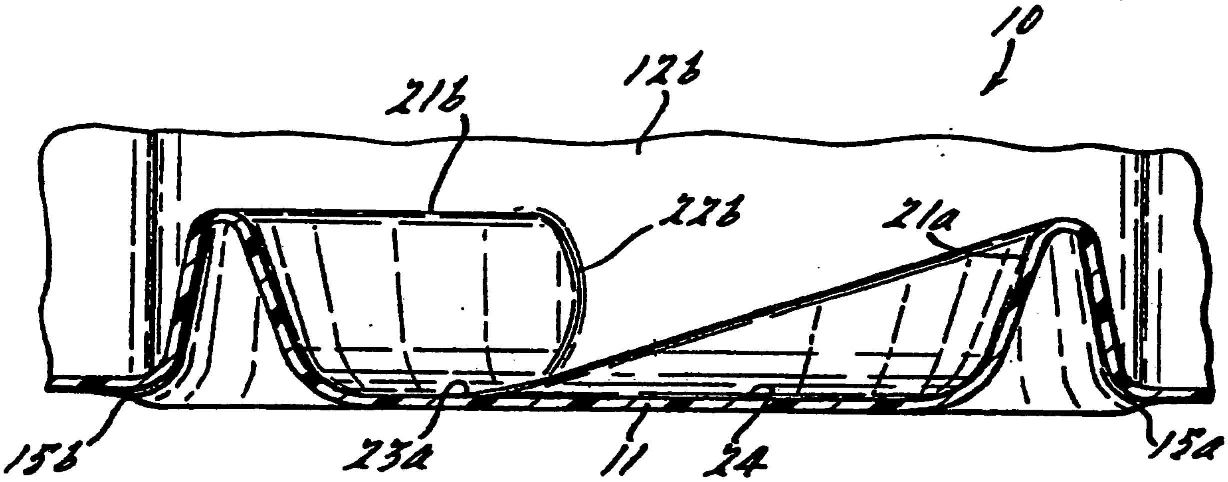


FIG. 3.

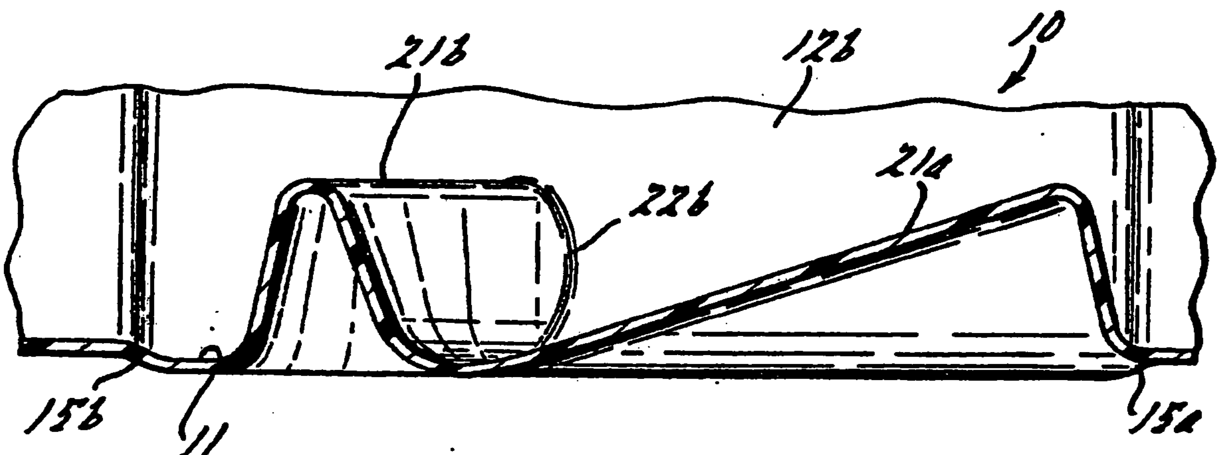


FIG. 4.

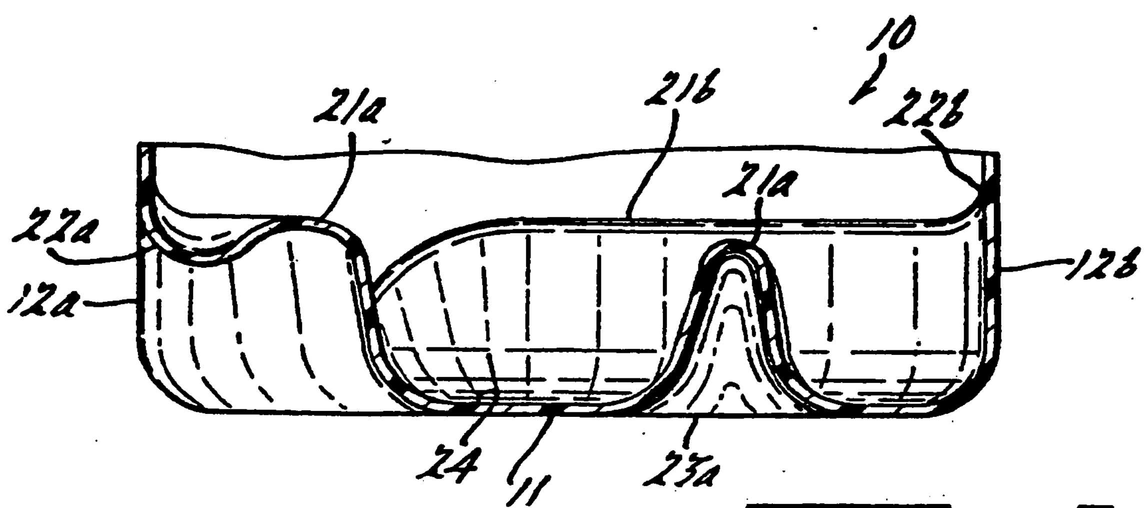


FIG. 5.